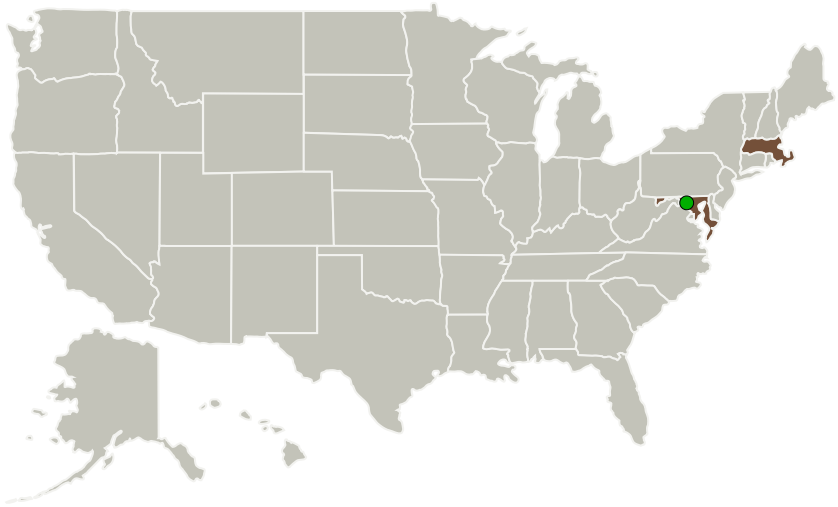
A LIBS/Raman System for Planetary Surface Measurement, Phase II

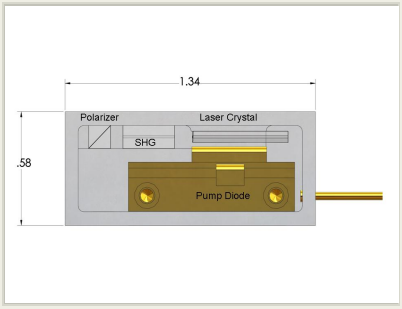
Completed Technology Project (2012 - 2015)

Project Introduction

For lightweight and power-efficient instruments that enable elemental and/or mineralogy analysis, Q-Peak proposes to develop a compact, robust, and efficient instrument capable of performing imaging spectroscopy, Laser-Raman Spectroscopy (LRS) and Laser Induced Breakdown Spectroscopy (LIBS). The main advantage in using these techniques for planetary science is the ability to rapidly collect a wealth of chemical information, by simply directing a laser beam on remote targets of interest. No sample preparation is necessary. As an important component of the Raman/LIBS instrument in Phase I, we developed, built and tested a 1.5 cubic-inch, Q-switched, solid state laser fitted with commercial, off-the-shelf optical components. The laser produced ~1 mJ, < 2 ns-duration pulses at 523-nm wavelength and was used to analyze a norite sample by means of Raman/LIBS techniques. In Phase II we propose to further miniaturize and ruggedize the Phase I laser to a size of < 1 cubic inch. We will scale up the energy-per-pulse up to 2 mJ and test the laser in a wide range of environments such as vibration, vacuum and temperature. We will design and test the optics in a CHAMP instrument modified to accommodate the compact laser. The TRL of the laser will be 6 at the conclusion of the effort.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Q-Peak, Inc.	Lead Organization	Industry	Bedford, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

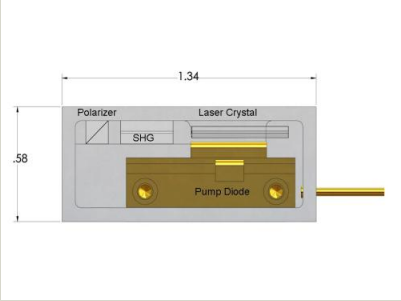
April 2012: Project Start

January 2015: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137390)*

Images



Project Image
A LIBS/Raman System for Planetary Surface Measurement *(https://techport.nasa.gov/image/129977)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Q-Peak, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Bhabana Pati

Co-Investigator:
Bhabana Pati

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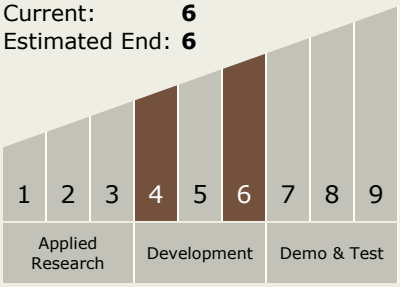
Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System